UCRL-WEB-200054

NETMON Reference Manual

Table of Contents

Preface

Scope: This NETMON Reference Manual introduces the goals of LC's network-monitoring web sites (open and secure), explains in detail the features of the tables and graphs that the sites provide, tells how to control network-monitoring output and how to customize both the data reported and the plots displayed, and gives typical examples of answering network-usage queries with the help of NETMON. It also introduces the separate DISCOM NETMON site (SCF only).

Availability: Open NETMON service is provided by a dedicated OCF web site (fly.llnl.gov), with access controlled by your LC login name and one-time password (OTP). Secure NETMON service is provided by a corresponding SCF web site (lc.llnl.gov/netmon) with access controlled by your SCF DCE password. DISCOM NETMON, on SCF only, has an independent URL (lc.llnl.gov/discom).

Consultant: For help contact the LC customer service and support hotline at 925-422-4531 (open e-mail: lc-hotline@llnl.gov, SCF e-mail: lc-hotline@pop.llnl.gov).

Printing: The print file for this document can be found at:

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on the OCF: http://www.llnl.gov/LCdocs/netmon/netmon.pdf
on the SCF: https://lc.llnl.gov/LCdocs/netmon/netmon_scf.pdf
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Introduction

NETMON is a controlled-access, dedicated LC web server (one each on OCF and SCF) that reports with tables and graphs on the performance of five common network services (PING, NETPERF, SSH, DNS, and FTP) between pairs of network nodes that you select (from a list of its monitored combinations). NETMON is easy to use (from any web browser) and displays useful data automatically because it incorporates plausible default settings. But you can customize NETMON's output to focus on your choice of specific network-node pairs, network services, or status conditions (e.g., DOWN) if you prefer, or to alter the units used (grain size). NETMON delivers four kinds of network performance reporting:

- A top-level, comprehensive *status*-of-service summary (the default),
- A mid-level report of detailed current performance *statistics* (for one pair of network nodes),
- A third-level *graphic* display of retrospective performance trends (the graphs shown vary by network service), and
- A fourth, separate, customized "report builder" with which you can request graphical displays not otherwise available (such as plots of cumulative statistics).

This NETMON Reference Manual tells how to reach the web sites (open and secure), how to interpret NETMON's four kinds of reports, how to navigate among them, and how to control or personalize NETMON's output by using its option menus and "report builder." Examples of performing typical NETMON tasks and a summary of NETMON administrator-only features are included as well. An independent implementation of NETMON on the secure network (only) reports exclusively on network traffic among ASCI DISCOM nodes at LLNL, LANL, and SNL; a short section (page 32) compares DISCOM NETMON with standard NETMON in behavior and scope.

Readers especially interested in FTP as a file-transfer network service, including local implementation of parallel FTP (PFTP), should consult LC's FTP Reference Manual (URL: http://www.llnl.gov/LCdocs/ftp). Also, LC's EZOUTPUT (URL: http://www.llnl.gov/LCdocs/ezoutput) basic guide surveys a variety of helpful network-related file-transfer and output tools, techniques, and features from the perspective of local needs.

How to Use NETMON

Starting NETMON

NETMON is a web server (one open, one secure) that you can contact and whose output you can control with any HTTP client (web browser), such as Internet Explorer (for which NETMON was optimized) and Netscape.

- On OCF:
  - ◊ Run a web browser on any OCF llnl.gov machine (access is restricted only to computers within this domain, or virtually in this domain by use of IPA or VPN).
  - ◊ Request the NETMON URL, namely:

```
https://lc.llnl.gov/netmon
or
http://fly.llnl.gov
```

  - ◊ Respond to NETMON's initial dialog box as follows:

```
Username:  [your LC login name]
Password:  [your current one-time password (OTP)]
```

- On SCF:
  - ◊ On any SCF-connected machine, type

```
groups
```

    to see if you belong to the user group called "netmon." If not, contact the LC Hotline to add yourself to that group. Only members of the "netmon" group can use the SCF NETMON web site.
  - ◊ Run a web browser on any SCF-connected machine.
  - ◊ Request the NETMON URL, namely:

```
https://lc.llnl.gov/netmon
```

  - ◊ Respond to NETMON's initial dialog box as follows:

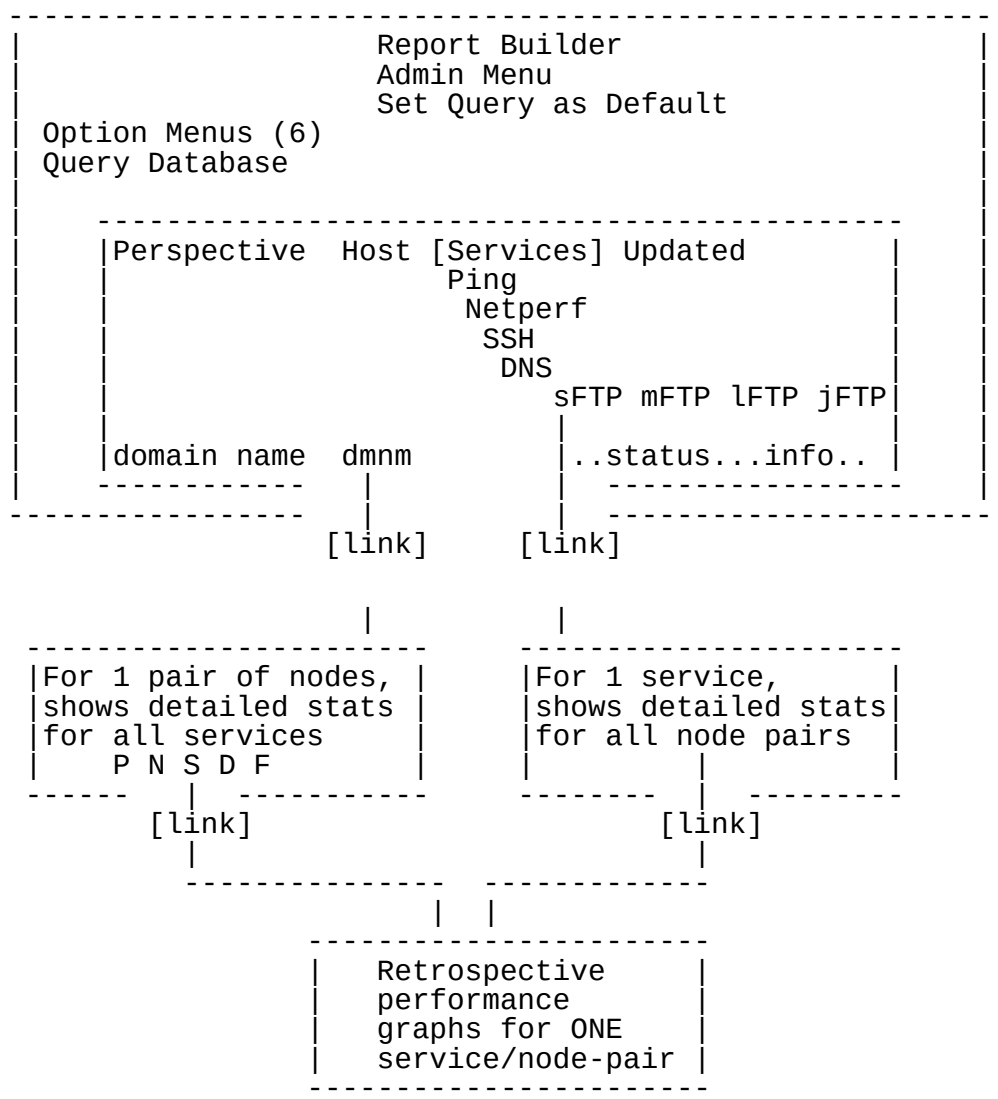
```
Username:  [your LC login name]
Password:  [your current SCF DCE password]
```

- NETMON then returns a full-screen tabular display of current network status information (labeled "System Query") for a default set of (mostly LC) network-node pairs (identified by pairs of domain names) and for five different network services (PING, NETPERF, SSH, DNS, and four flavors of FTP).
    - ◊ For help interpreting NETMON's status report, see the analysis and diagram in the next subsection. (page 7)
    - ◊ For how to display more detailed statistics (on a specific part of the network or on a specific service) by following links from NETMON's status report, see the second subsection (page 13) below.
    - ◊ For ways to temporarily select subsets of network-node pairs or service-status values for reporting, or to otherwise control the scope of NETMON's reports, see the Options section (page 22) below.
    - ◊ For how authorized system administrators (only) can permanently customize NETMON output, see the special administrative section (page 31) below. The number and variety of network-node pairs on which NETMON reports by default is adjustable by a system administator using this control feature.

Interpreting NETMON's Default Report

NETMON greets every newly logged-in user by displaying a default table of current network status information, with links to greater statistical detail and menu options to (temporarily) customize the scope of the display. No set up or user profile is needed to get NETMON's default report.

This diagram visually summarizes the features that NETMON offers in its default report:



Below is an explanation of the primary features here; later sections explain the linked-in (page 13) (secondary reporting) features and the customization options (page 22) ("Option Menus") that you can access starting from NETMON's default page.

SPECIAL TASKS (TOP):

At the very top of its default report, NETMON offers three centered features that are *not* part of the report itself but that perform special tasks helpful for some users. These features and their very different special tasks are (in the order that NETMON lists them):

Report Builder

[link] leads to another set of menus that lets you request and then display customized statistical graphs for your choice of service (e.g., FTP), network activity (e.g., file PUTs), and network-node pair(s). For usage details, see the subsection (page 19) that follows the discussion of "Detailed Statistics" default reports below.

Admin Menu — [button] allows authorized system administrators (only) to change NETMON's default public behavior (for *all* users). See the separate administrative section (page 31) near the end of the manual for usage details.

Set Query as Default

[button] allows you to preserve your personal option-menu choices as your default NETMON report, even across separate NETMON sessions (but without affecting other users). Since this is an option-related task, usage details appear in a subsection (page 26) of the discussion of "NETMON Options" below.

DEFAULT REPORT (MIDDLE):

The core of NETMON's default report is an 11-column table that uses data from an automatic SQL query of a network-status database to show the current state of five network services between various pairs of

network nodes. The columns in this table (see the Perspective...Updated line across the middle of the diagram above) are:

Perspective — specifies (by its domain name, such as blue001.pacific.llnl.gov) the first member in a unique pair of network nodes, one pair for each row in the status table. It is FROM the "perspective" of this first node TO the node named in the second (Host) column that the status reported in the other columns of each row pertains. (When NETMON reports that the perspective node itself is down, it uses the term "slave down.")

By default, open-network NETMON reports on the 10 different perspective nodes listed here, picked for their role in revealing interesting network performance (but you can use NETMON's option menus (page 22) to select any subset of these for a shorter, more personalized table):
blue001.pacific.llnl.gov
blue099.pacific.llnl.gov
blue199.pacific.llnl.gov
blue280.pacific.llnl.gov
cola.llnl.gov
frost.llnl.gov
lc-test.llnl.gov
lucy.llnl.gov
olnhds.llnl.gov
riptide.llnl.gov.
Secure-network NETMON offers a different but analogous list of SCF perspective nodes.

Host

specifies (by its domain name, such as storage.llnl.gov) the second member in a unique pair of network nodes, one pair for each row in the status table. It is TO this host node FROM the perspective of the node named in the first column of the same row that the status reported in the other columns of each row pertains.

By default, open-network NETMON uses about 20 different host nodes to construct perspective-host pairs. But not every host is paired with every perspective node: some perspective nodes serve as host nodes too (e.g., cola.llnl.gov, paired with a different perspective than itself, of course), while some perspective nodes are paired with multiple specific nodes on riptide, with multiple specific nodes on frost, with storage.llnl.gov, with vpn.llnl.gov, or even with the three nonLLNL host nodes jupiter.ccs.ornl.gov, www.es.net, or www.lbl.gov. NETMON pairs some perspectives with as many as 18 of the 20 available hosts, while it pairs others with as few as 2 hosts. The default pairs are picked for their role in revealing interesting network performance (but you can use NETMON's option menus (page 22) to select any subset of the default hosts for a shorter, more personalized table). Secure-network NETMON offers a different but analogous list of SCF host nodes.

Every domain name that appears in the Host column of NETMON's status-report table serves also as an active link to retrieve a table of detailed statistics about (and indirectly, graphs of) the performance of every network service available between the perspective-host node pair specified on that row. See the Link section (page 13) below for more on this secondary reporting feature.

[Services] reports the current status of five key network services, one in each of several adjacent columns (explained below). The HEADER of each service column names the service and acts also as an interactive link to retrieve a table of detailed statistics about the performance of that single service between every relevant pair of perspective-host network nodes (or a subset of node pairs if you have specified one). See the Link section (page 13) below for more on this secondary service report. NETMON subdivides FTP service by size of file transferred (based on "classes of service" for LC's file-storage system HPSS), and reports on each file size in a separate column.

The five covered network services (in the order reported, with four separate columns for FTP's subdivided traffic) are:

PING sends ECHO_REQUEST packets to a specified network host and reports the host's availability, along with optional round-trip time and packet-loss statistics.
NETMON can report any of these status values in the PING column:

- UP — means the queried host is available from the perspective node (usually reported in green, but some Netscape users will see this status in black).
- DOWN — means the queried host is not available from the perspective node (usually reported in red, but some Netscape users will see this status in black).
- SLAVE DOWN — means the perspective node is down itself, so all hosts appear unavailable from its viewpoint.
- - — means that this service is not monitored (and perhaps is not even available) between the pair of network nodes covered on this table row.

NETPERF monitors data throughput and lost or resent packets to a specified network host.
NETMON can report any of the same status values for NETPERF as for PING (above).

SSH connects to and logs in to a remote host, allowing you to securely execute commands there.
NETMON can report any of the same status values for SSH as for PING (above), and one additional status:

- UP WITH ERROR — means that SSH can connect to the remote host but cannot provide regular service (usually because of some authentication problem).

DNS	resolves domain names into IP addresses for a networked computer. NETMON can report any of the same status values for DNS as for PING (above).
sFTP	connects to and transfers "small" files (less than 4 Mbyte) to or from a remote host. NETMON can report any of the same status values for sFTP as for SSH (above).
mFTP	connects to and transfers "medium" files (from 4 Mbyte to less than 32 Mbyte) to or from a remote host. NETMON can report any of the same status values for mFTP as for SSH (above).
lFTP	connects to and transfers "large" files (from 32 Mbyte to less than 256 Mbyte) to or from a remote host. NETMON can report any of the same status values for lFTP as for SSH (above).
jFTP	connects to and transfers "jumbo" files (256 Mbyte or larger) to or from a remote host. NETMON can report any of the same status values for jFTP as for SSH (above).

Updated — reports the day, date, and 24-hour time when the status information shown in the services columns was last updated.

Following Links to Detailed Statistics

In NETMON's default report, (page 7) the domain name of each reported host (second column) and the column header for each reported network service (e.g., FTP) serve also as interactive links to a secondary report, a page of detailed performance statistics (and indirectly to another link to relevant performance graphs too). These subsections explain those additional reports and graphs.

Statistics By Host

The domain name of each host (column 2) in NETMON's primary status report (page 7) links to a second table that displays detailed network-performance statistics tailored to that host and its relevant services.

CONTEXT:
To avoid confusion, each NETMON statistics-by-host report has a banner headline of the form "host node from perspective node" (for example, "frost.llnl.gov from blue199.pacific.llnl.gov") that clearly specifies which pair of network nodes the reported statistics cover (and what role each node had in gathering those statistics).

Further clarifying context is provided by repeating (just below the headline) the single row from NETMON's primary status report that led you to this secondary table (so that your chosen perspective-host node pair and the current status of their services are always visible while you study the more detailed statistics).

DETAILS:
Not all network services pertain to all perspective-host node pairs. (For example, only PING and FTP pertain to node pairs that include storage.llnl.gov.) For each of the five monitored services that does pertain to the node pair that you selected, NETMON displays the following detailed statistics (which vary by service). Note that if *any* numerical field contains -1 in a NETMON statistics report, then one of the two relevant nodes is down and actual data for that field are unavailable.

PING	shows the current statistics on:	
	Stat	latest UP/DOWN status (repeated from the summary row above).
	PingMin	minimum echo response time (in ms).
	PingMax	maximum echo response time (in ms).
	Lost	percentage of lost packets during echo test.
	Uptime	time since last PING state change (in days, or hours or minutes if very small).
	Updated	day, date, and time of the most recent statistics.
	Comments	nonstandard clarifying status information, such as "timed out" or "host not available."

NETPERF shows the current statistics on:

Stat	latest UP/DOWN status (repeated from the summary row above).
There	rate at which data travels between your selected perspective and host nodes (toward host, in Mbytes/s).
Back	rate at which data travels between your selected perspective and host nodes (toward perspective, in Mbytes/s).
Retransmitted	number of packets that had to be resent during current monitoring period.
Uptime	time since the last NETPERF state change (in days, or hours or minutes if very small).
Updated	day, date, and time of the most recent statistics.
Comments	nonstandard status information, based on and labeled by the options with which NETPERF was last run: -l (length), -v (verbosity level), -S (receiving sockets), -s (sending sockets).

SSH shows the current statistics on:

Stat	latest UP/DOWN status (repeated from the summary row above).
Stdout	"standard out" transmission rate in Mbytes/s.
Stderr	"standard error" transmission rate (normally 0.0) in Mbytes/s.
Updated	day, date, and time of the most recent statistics.
Comments	nonstandard status information, such as Connection Refused, No Response from Host, Server Refused Key, Authorization Failed.

DNS	shows the current statistics on:	
	Stat	latest UP/DOWN status (repeated from the summary row above).
	Timed	time to resolve a domain name (in seconds).
	Uptime	time since the last DNS state change (in days, or hours or minutes if very small).
	Updated	day, date, and time of the most recent statistics.
	Comments	nonstandard status information, such as: DNS server name and address, DNS client name and address.
[smlj]FTP	shows the current statistics on:	
	Stat	latest UP/DOWN status (repeated from the summary row above).
	Put	file-transfer rate from perspective node to host node (in Mbytes/s).
	Get	file-transfer rate from host node to perspective node (in Mbytes/s).
	Lost	actual count of packets lost since the last FTP session.
	Uptime	time since last FTP state change (in days, or hours or minutes if very small).
	Updated	day, date, and time of the most recent statistics.
	Comments	nonstandard status information, mostly the same as for SSH service.

CONTROL FEATURES:

On each statistics-by-host detailed report, NETMON offers several ways to further customize and then regenerate the output. You can further restrict the detailed report (by chosing from offered menus) to cover only one specified service, or only services with a specified status (e.g., UP), or only statistics for a specified range of dates.

Also, the name of every service (e.g., sFTP) along the left side of NETMON's statistics-by-host table serves also as a link to retrieve retrospective performance graphs for the perspective-host node pair and the service that you selected. A subsection below (page 17) explains these graphs, and NETMON's Report Builder (page 19) feature lets you make more customized plots if you prefer.

Statistics By Service

The column header for each reported network service (e.g., FTP) in NETMON's primary status report (page 7) links to a second table that displays detailed network-performance statistics tailored to that service and to the pairs of network nodes for which that service pertains.

Not all network services pertain to all perspective-host node pairs. For example, on the open-network NETMON, FTP service pertains only to node pairs that include just a few (of the many possible) perspective nodes monitored (including blue199.pacific.llnl.gov, frost.llnl.gov, and riptide.llnl.gov). For each perspective-host node pair to which your selected service does pertain, NETMON displays a row (identified by the pair's two domain names) of relevant detailed performance statistics.

The reported statistics vary by service, and each appears in a column of its own. For a list of the column headers (by service) and an explanation of just what is reported in each column, see the itemized service descriptions in the "Statistics by Host" (page 13) subsection above. NETMON reports exactly the same performance statistics in its statistics-by-host format and its statistics-by-service format. Only the scope of the report and the visual arrangement of the statistics in the output table differ between these two formats.

Also, the domain name of every host (e.g., storage.llnl.gov) in the second column of NETMON's statistics-by-service table serves also as a link to retrieve retrospective performance graphs for the perspective-host node pair and the service that you selected. A subsection below (page 17) explains these graphs, and NETMON's Report Builder (page 19) feature lets you make more customized plots if you prefer.

Along the left edge of every statistics-by-service table is a menu that lists *every* service (with your current choice highlighted). This lets you move easily to a different service report (for the same node pair) without returning to NETMON's home page (although a Home menu item here facilitates that move as well).

Performance Graphs

As a third level of network statistics reporting (below its status-summary (page 7) and detailed-statistics (page 13) tables, NETMON offers retrospective performance graphs that visually track each of its five network services (PING, NETPERF, SSH, DNS, FTP) through time.

ACCESS:
You can reach NETMON's performance graphs (see path diagram (page 7) above) by following active links along either of two paths:

(1) selecting one perspective-host node pair by clicking on the domain name for the host in NETMON's top-level status (default) report, and then selecting one service by clicking on the service name in NETMON's second-level statistics table for that node pair, or

(2) selecting one service by clicking on the service name in the column header of NETMON's top-level status (default) report, and then selecting one perspective-host node pair by clicking on the domain name for the host in NETMON's second-level statistics table for that service.

Either way, you end up specifying exactly one service and one pair of perspective-host network nodes. In response, NETMON plots (recent) historical performance statistics appropriate for that service between that pair of network nodes and presents the results in several axis-labeled, color-coded retrospective graphs. The scope of each graph here is standardized (out of your control, as described in TIME SPANS and COVERAGE below). But if you prefer, you can use NETMON's Report Builder (page 19) feature to make similar *customized* graphs, where *you* specify the time span, statistics plotted, and other scope details.

TIME SPANS:
NETMON's performance graphs (separately) cover four time spans each ending with the present as follows (the shortest time span varies with the service):

```
Graph (1)  PING    1 hour
           NETPERF none
           SSH     12 hours
           DNS     none
           FTP     12 hours
Graph (2)  1 day (= 24 hours)
Graph (3)  7 days (= 168 hours)
Graph (4)  31 days (= 744 hours)
```

COVERAGE:
The performance statistics that NETMON plots over these time spans for each network service (between your chosen perspective-host node pair) are:

PING	graphs show minimum (green) and maximum (red) round-trip times (RTT) in ms.
NETPERF	graphs show "there" rate (green) and "back" rate (blue) in Mbyte/s, and, if any packets were retransmitted, the number per time of day (red).
SSH	graphs show stdout (green) and stderr (red) transmission rates, both in Mbytes/s.
DNS	graphs show response time (green) for domain name service in seconds.

FTP graphs show transmission rates for getting (green) and putting (blue) files, both in Mbytes/s, as well as the lost-packet count (red).

CUSTOMIZED ALTERNATIVES:

If NETMON's standard performance graphs do not meet your monitoring needs, you can instead design customized graphs that present NETMON's network data in very different ways not available by default. See the Report Builder (page 19) section (next) for usage details.

Graphical Report Builder

NETMON's "Report Builder" is a separate feature linked from the top center of its default status report (page 7) (home) page. The Report Builder generates a color line graph (no tabular values, just the labeled plot) that shows the statistics that you select (e.g., mFTP PUT traffic) between the perspective and host nodes that you select for the time period that you select (by default, for all times for which NETMON has relevant data). If NETMON does not monitor your chosen statistics between your chosen pair of nodes, then instead of a graph the Report Builder returns an error message (or sometimes, a "does not monitor" message).

ACCESS.
Report Builder supplements NETMON's standard performance graphs (details below), but you can only invoke it from NETMON's home page, not from any of NETMON's more specific reports or graphs themselves.

DIFFERENCES (CUSTOMIZATIONS).
Report Builder output differs from NETMON's standard retrospective performance graphs (page 17) in several ways that reflect the greater *customization* that it offers. Only with Report Builder can you:

- Plot network traffic from *several* perspectives to one host (or to several hosts from one perspective) on the same axis for easy comparison. NETMON's standard graphs, on the other hand, always represent only a *single* perspective-host node pair.
- Add a separate "accumulate" line to show total traffic on the same axis as the (usual) plots of individual between-node traffic (or omit this if you prefer).
- Choose just *one* kind of statistic (just PUTs, not GETs, for FTP traffic, for example) to plot, rather than plotting all statistics relevant to a service (such as FTP) as shown on NETMON's standard graphs.
- Generate many *different* plots (for different node pairs or for different statistics) with one pass through the Report Builder menu tree for convenience if you wish (NETMON's standard performance graphs always show only statistics for a single node pair at a time).
- Specify any *time range* (on which NETMON has data) rather than just plot data for the default time range that NETMON assigns to each service when it makes its standard performance graphs.

FIRST MENU.
The Report Builder link leads to a first menu on which you choose your network service and number of simultaneous plots:

Tables (no default) lists each available network service (Ping, SSH, etc.) on which NETMON keeps statistics and lets you select (click on) those you want subsequent plots to display.

Number of charts

(default 1) lets you type into a text field the number of different node pairs whose statistics you want NETMON to plot at the same time. This is a convenience feature for users who want multiple plots, since you could get the same result simply by

cycling through the whole Report Builder process repeatedly, once for every specific node pair you wanted to see. Inserting *n* in this field causes Report Builder to offer you *n* horizontally parallel sets of node-specifying fields on its second menu (below), so you can independently specify *n* different plots at the same time.

Process Query is a button that generates and displays Report Builder's second menu (below), customized to reflect your scope choices from the first menu.

SECOND MENU.

Report Builder's second menu lets you specify, for the service already picked (above), the node pairs and specific statistics to plot (if you requested more that one "chart" on the first menu, then you will see more than one copy of each field here, in parallel horizontally):

Name of perspective node

is a scrollable list of domain names of available perspective nodes from which you can select (click on) one or more for monitoring (if you select multiple perspectives here, then pick a single host in the next field).
WARNING: If you happen to select even one perspective-host node pair between which NETMON does not currently monitor the statistics that you picked on the first Report Builder menu, then Report Builder will make no plot at all. So check the default (comprehensive) status report (page 7) before picking your node(s) here.

Name of Host is a scrollable list of domain names of available host nodes from which you can select (click on) one or more for monitoring (if you select multiple hosts here, then pick a single perspective in the previous field).
WARNING: If you happen to select even one perspective-host node pair between which NETMON does not currently monitor the statistics that you picked on the first Report Builder menu, then Report Builder will make no plot at all. So check the default (comprehensive) status report (page 7) before picking your node(s) here.

Stats Field lets you select (click on) one or more specific statistics to plot relevant to your previous service choice. For example, PUTs and GETs are offered here (only) for FTP service, while PingMin and PingMax are offered here (only) for Ping service.

Accumulate or Separate Lines

controls the plotting of your previously chosen statistics with either of two exclusive radio buttons aligned under this heading:

Separate plots (in the ordinary way) one line graph of your chosen network traffic statistic for each node pair that you selected (for example, one line each showing FTP PUT traffic from several perspective nodes to host node storage.llnl.gov). This format most resembles NETMON's standard performance graphs. (page 17)

Accumulate — plots *in addition to* the "separate" lines above a line for the total (accumulated) traffic that you selected (for example, an added line plotting the total FTP PUTs from *all* of your selected perspective nodes to storage). NETMON's standard performance graphs never plot such totals (because they always cover only a single perspective-host pair).

Time Period — specifies the time range of NETMON data to display on the line graphs that you selected with all your previous menu choices, where:

From — (a text input field) specifies the start date (*mm/dd/yy*) for the data (default: the beginning of NETMON data for your selected services, which varies by service).

To — (a text input field) specifies the end date (*mm/dd/yy*) for the data (default: today). Make FROM and TO the same date to display just one day of data.

Process Query — is a button that generates and displays Report Builder's labeled graphical output, customized to reflect your first- and second-level menu choices. If you have requested an impossible report, the message "invalid argument supplied" will appear instead of a plot.

NETMON Options

Along the left side of its top-level (default) status report, (page 7) NETMON offers six option menus for requesting more restricted (or differently presented) reports than its default (all-inclusive) report. Below the option menus is a "Query Database" button that forces NETMON to replace your previous status report with a new one that meets the conditions you imposed with your current option-menu choices.

WARNING: after each use of the Query Database button, all option settings revert to their default values automatically. Use the "Set Query as Default" button, explained in a subsection below (page 26), to circumvent this reset and preserve your chosen options for easy reuse.

Internet Explorer, but not Netscape, lets you select multiple items from the same menu by holding down CTRL or SHIFT while you highlight with your mouse.

Like NETMON's option menus (described here), NETMON's separate Report Builder (page 19) lets you customize output from the web site. But it uses a completely independent set of control menus, as explained in its own section above.

Option Menus

NETMON's option menus (and their subchoices) are:

Units specifies how NETMON reports quantity and rate values on its detailed service tables (or on plots of them). Possible units are:

Mbytes	(the default) reports quantities in megabytes and rates in megabytes/second.
Mbits	reports quantities in megabits and rates in megabits/second.

Status of Nodes

selects which service-status values you want included in NETMON's status-report table (NETMON includes only rows that contain the status values you specify, or delivers a table with no rows if none contain your specified status values). Possible status values are:

ALL	(the default) includes rows with any service status.
UP	includes rows in which the service is reported UP.
UP WITH ERROR	(pertains to SSH and FTP only) includes rows where a service opens a connection between nodes but cannot transfer data.
DOWN	includes rows in which the service fails.
SLAVE DOWN	includes rows in which the service fails to every host node because your chosen perspective node is itself down.

Effecting which Stat

selects the services for which you want NETMON to report status values. When NETMON generates your new report, it looks for your specified status values (above) only in the service column(s) that you designate here (the default is all services), although the column header of the output table always shows a column for every service. Possible "stats" (services) are:

PING	reports on the ECHO_REQUEST packet service.
NETPERF	reports on the throughput-timing service.
SSH	reports on the secure interactive-login service.
DNS	reports on the domain name service.
sFTP	reports on file-transfer service for "small" files (less than 4 Mbyte).

mFTP	reports on file-transfer service for "medium" files (from 4 Mbyte to less than 32 Mbyte).
lFTP	reports on file-transfer service for "large" files (from 32 Mbyte to less than 256 Mbyte).
jFTP	reports on file-transfer service for "jumbo" files (256 Mbyte or larger).

Name of Perspective Node

selects which perspective (first-column) network node(s) to include in NETMON's status-report table (NETMON includes only rows that contain the perspective-node domain name(s) that you specify here; the default is all monitored perspective nodes).
Possible OCF perspective-node domain names are:
blue001.pacific.llnl.gov
blue099.pacific.llnl.gov
blue199.pacific.llnl.gov
blue280.pacific.llnl.gov
cola.llnl.gov
frost.llnl.gov
lc-test.llnl.gov
lucy.llnl.gov
olnhds.llnl.gov
riptide.llnl.gov

Name of Host

selects which host (second-column) network node(s) to include in NETMON's status-report table (NETMON includes only rows that contain the host-node domain name(s) that you specify here; the default is all monitored host nodes).
Possible OCF host-node domain names include:
blue001.pacific.llnl.gov
blue199.pacific.llnl.gov
blue280.pacific.llnl.gov
cola.llnl.gov
frost.llnl.gov
frost067-ge2.llnl.gov
frost067-ge3.llnl.gov
frost067-ge4.llnl.gov
frost067-ge5.llnl.gov
jupiter.ccs.ornl.gov
lc-test.llnl.gov
lucy.llnl.gov
olnhds.llnl.gov
riptide-eg2.llnl.gov
riptide-eg3.llnl.gov
riptide-eg4.llnl.gov

riptide-eg5.llnl.gov
riptide.llnl.gov
storage.llnl.gov
texas.llnl.gov
vpn.llnl.gov
www.es.net
www.lbl.gov

Order By — sorts the rows of NETMON's status report table by the key that you select with one of two mutually exclusive radio buttons:

- Perspective — (the default) sorts by the domain name(s) of your selected perspective (first column) network nodes.
- Host — sorts by the domain name(s) of your selected host (second column) network node.

To generate a new NETMON status report that meets the conditions currently specified by your option-menu choices, click on the Query Database button below all the option menus:

Query Database

(1) builds an SQL query whose constraints match your current options-menu choices for nodes, services, and status values to cover, and submits that query to NETMON's network-traffic database.

(2) shows the query results as a new status table that replaces NETMON's former top-level table. NETMON shows only relevant rows; if your option choices happen to yield a null result, then NETMON displays a table with the column headers but containing no rows at all.

(3) resets all NETMON option menus to their default values (generally, their most inclusive values). Hence, a second use of the Query button (re)generates NETMON's default status-report table automatically. To preserve nondefault option settings across multiple NETMON queries, you must use the special "Set Query as Default" button described in the next subsection.

Set Query as Default

At the top center of its default report (page 7) (or "home page," to which its many HOME buttons return), NETMON offers the button "Set Query as Default" and two related radio buttons (NO/YES), all in a row:

```
No[x] Yes[ ] [Set Query as Default]
```

Together, these buttons let you preserve your option settings (explained above) not only for repeated use during the current browser session (by default, all options revert to their default values each time that you query NETMON's database) but also between separate NETMON sessions as well. Only your personal NETMON reports are affected, not those of any other user. And you can restore NETMON's default (all-inclusive) reports whenever you wish. Successful use of the "Set Query as Default" buttons is less than obvious, however.

To preserve your nondefault option settings across multiple NETMON queries (or even across multiple NETMON sessions), follow these steps:

(1) Select your nondefault option settings as usual (see the previous subsection (page 23)) from the menus along the left side of NETMON's top-level status report.

(2) Click on the Query Database button.
WARNING: you must perform one query with your nondefault option settings *before* you can preserve them for future reuse.

(3) Confirm that the resulting personalized status table meets your needs (or repeat the above steps to adjust the output until it does).

(4) Click on the YES radio button and then click on the "Set Query as Default" button immediately to its right. (The radio buttons automatically revert to NO after one YES use.)

(5) This preserves your option settings (even though the visible menus on the left edge of the status report revert to their default values afterward). An updated, customized status table, as specified by your preserved nondefault option settings, will now appear whenever you--

- Use any NETMON Home button, or
- Exit your browser and restart it, or
- Click on the "Set Query as Default" button again (to request a refreshed display).

(6) You can now use the left-edge option menus to request *other* reports, and click on the standard (bottom-left) Query Database button to display those reports. Or click on the Query Database button when the option menus have reverted to their default (inclusive) values to see a comprehensive report. Click on the "Set Query as Default" button at any time to redisplay an updated report in your preserved, customized format.

(7) To cancel (abandon) your preserved option settings and resume NETMON's normal behavior--

- First, let the option menus revert to their default settings and click on Query Database to generate a default (inclusive) status report.

- Second, at the top of that report, click on YES and then on "Set Query as Default" to write over (cancel) your formerly preserved nondefault option settings.

Examples

[1]

GOAL: To see a *default* overview report that surveys the status of all five monitored network services (PING, NETPERF, SSH, DNS, FTP) between all monitored pairs of OCF perspective-host network nodes.

STRATEGY: Unlike a database interface for which you must supply some query to see any tables at all, NETMON automatically builds and displays the results of a comprehensive, current status query (all services, all status values, all monitored node pairs). You can then pursue details by following links (page 13) from the default report.
For instance, to display NETMON's default status report for OCF, run an LLNL WWW client (browser) with this information:

```
URL: https://lc.llnl.gov/netmon
On NETMON's login box...
   Username: [your LC login name]
   Password: [your current one-time password]
```

---

[2]

GOAL: To limit the *scope* of NETMON's report(s). For example, to display only the rows for those perspective-host network node pairs between which jFTP ("jumbo" FTP) service is currently DOWN.

STRATEGY: (1) Display NETMON's default ("home" or "Status Query") report (see Example 1 above) or return to that report from any other more specialized display (use the Home or Back buttons provided).
(2) Along the left side of the default report, select (click on):
DOWN.....from the Status of Nodes menu, and
jFTP.....from the Effecting which Stat menu.
(3) Scroll down to the Query Database button (below all the option menus on the left side) and click to generate and automatically display the results of your more restricted query.

```
Usage notes:
(A) if no rows satisfy your query, the resulting NETMON
    table will be empty except for its column headers.
(B) NETMON automatically resets all option menus to
    their default values (usually ALL) immediately
    after processing each query.
```

---

[3]

GOAL: To see standard NETMON performance *graphs*. For example, to graphically examine the recent retrospective performance of PING service between OCF nodes blue199.pacific.llnl.gov and storage.llnl.gov.

STRATEGY: (1) Display NETMON's default ("home" or "Status Query") report (see Example 1 above) or return to that report from any other more specialized display (use the Home or Back buttons provided). NETMON's graphs are two layers below this default display.
(2) Scroll down the status table until you find the row whose first two columns contain the perspective-host node pair that interests you. Here, that is about 17 rows down the table, with blue199.pacific.llnl.gov in the FIRST column and storage.llnl.gov in the SECOND (host) column.
(3) Click on the domain name in the second (host) column. Here, that name is storage.llnl.gov.
(4) NETMON builds and displays a secondary detailed statistics table with one row for each service (here, only for PING, sFTP, and mFTP) available from your chosen perspective node to your chosen host node (all other node pairs are ignored).
(5) In this detailed statistics table, click on the name of the service whose performance you want graphed. Here, that is PING (first row, first column).
(6) NETMON builds and automatically displays four color-coded, axis-labled graphs showing PING's maximum and minimum round trip times (between your chosen pair of nodes) for the most recent 1 hour, 24 hours, 168 hours (7 days), and 744 hours (31 days).

```
Usage notes:
Output graphs vary by service.
See the Performance Graphs
section above for details.
```

---

[4]

GOAL: To build and then display a *customized* line graph (of SCF FTP traffic for two node pairs at once, with total), using NETMON's Report Builder.

STRATEGY: (1) Select (click on) the Report Builder link from the top center of NETMON's home-page status report.
(2) Select sFTPStats (small-sized-file FTP traffic) from the Tables list at the top of Report Builder's *first* menu. (Leave the default "number of charts" at 1.)
(3) Click on the Process Query button (bottom of the first menu).
(4) Select from the perspective node list on Report Builder's *second* menu the two source nodes for traffic monitoring (such as SCF nodes adelie0 and emperor1).
(5) Select from the host node list the target node for traffic monitoring (such as storage.llnl.gov). WARNING: If you happen to select even one perspective-host node pair for which NETMON does not monitor sFTP traffic, then Report Builder will make no plot at all. So check the default (comprehensive) status report before picking your nodes here.
(6) Select from the "sFTPStats Field" list the specific statistics to plot (such as PUTs).
(7) Select the "Accumulate" radio button (to disable the "Separate" default and request a plot of *total* PUT trafffic from both perspective nodes to storage.llnl.gov).
(8) Leave the Time Period fields blank, to accept the default values (i.e., plot NETMON's maximum available data).
(9) Click on the Process Query button (bottom of the second menu).

```
Usage notes:
Output graph shows (in different colors) the
per-node sFTP PUT traffic as plotted lines,
and the total PUT traffic for both nodes as
another line plotted on the same axis
(none of the lines is labeled).
```

Administrative Privileges

Authorized system administrators (only) can permanently alter NETMON's default reports for all users by adding or removing either a perspective node or a host node from NETMON's inventory of monitored nodes. (By contrast, the options menus (page 22) available to all users only change NETMON's output temporarily, and the change affects only the single user who requested it.)

ACCESS:
Click on the Admin Menu button at the top of NETMON's status-summmary default report. (page 7)
Respond to the dialog box with NETMON's special admin-username and admin-password, both different than those with which ordinary users access NETMON's public features.

PRIVILEGED CHANGES:
NETMON offers authorized system administrators two pairs of mutually exclusive radio buttons to specify the kind of change desired:

HOST|PERSPECTIVE

specifies whether you want to change a host node or a perspective node (reported as "slave" when DOWN in NETMON status tables) in NETMON's inventory of monitored network nodes.

ADD|REMOVE

specifies whether you want to add another node to monitor or remove a node from the already-monitored set.

NETMON then offers an interactive form on which you supply the (full) domain name of the changed node, the services to monitor, and the other node in the pair (from NETMON's current list) so that appropriate new row(s) can appear in future NETMON output. Removals follow a similar pattern with appropriately different details. Remember, these changes affect every NETMON user; use the NETMON "public" option menus to request local, temporary output changes. Nodes set "administratively down" (if any) are marked with gray shading on subsequent NETMON status reports.

NETMON for DISCOM

Members of the ASCI DISCOM (Distance Computing) community, which promotes sharing computer resources among the LLNL, LANL, and SNL sites, may benefit from a separate NETMON implementation devoted to DISCOM network traffic. Called "DISCOM NETMON," this is a web site on the LLNL classified network that is completely indepentent of the regular SCF NETMON site (no links between them, no shared data) yet that offers the same tracking and plotting features for network traffic between pairs of selected DISCOM nodes.

ACCESS.
To use the DISCOM NETMON site, run a web browser on any SCF-connected machine and request the dedicated URL

`https://lc.llnl.gov/discom`

Note the 's' in https. You will need to supply your SCF login name and your SCF DCE password in a dialog box, but *no* special group membership is needed (unlike for the main SCF NETMON site).

SIMILARITIES.
The DISCOM NETMON site behaves just like the main NETMON site, with:

- The same three *levels* of standard network activity reporting plus a customizable "report builder,"
- The same *control options* for units, statistics reported, and node choices, and
- The same five monitored *network services* (PING, NETPERF, SSH, DNS, and four FTP varieties by file size).

DIFFERENCES.
The DISCOM NETMON site differs from the main NETMON site primarily in the scope of network nodes whose activity it monitors:

- Forty perspective/host node pairs are covered, all different from the combinations reported on the main NETMON site (and many not limited to the LLNL SCF network).
- The five *perspective* nodes include two at LANL and one at Sandia as well as two at LLNL.
- The many *host* nodes include QA, QB, and Bluemountain at LANL, as well as others at Sandia.
- Problems noted in the NETMON status report here include *across-system* issues never seen with local NETMON, such as expired Kerberos tickets, nonauthoritative answers, and failed logins.

Disclaimer

Keyword Index

To see an alphabetical list of keywords for this document, consult the next section (page 35).

Keyword	Description
entire	This entire document.
title	The name of this document.
scope	Topics covered in this document.
availability	NETMON's web site.
who	Who to contact for assistance.
introduction	Overview of this document.
netmon-usage	How to use NETMON.
execute-line	Contacting the NETMON web site.
netmon-url	Contacting the NETMON web site.
default-report	Interpreting NETMON's status report.
detailed-statistics	Following links to detailed statistics.
details-by-host	Network statistics for a node pair.
details-by-service	Network statistics for a service.
graphs	Retrospective network performance graphs.
report-builder	Customized network performance graphs.
options	Customizing NETMON output.
option-menus	Requesting nondefault queries and output.
set-default	Preserving option choices across queries.
examples	Typical NETMON tasks explained.
admin-menu	System administrator privileges.
discom	Separate NETMON site supports DISCOM.
index	The structural index of keywords.
a	The alphabetical index of keywords.
date	The latest changes to this document.
revisions	The complete revision history.

Alphabetical List of Keywords

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a	The alphabetical index of keywords.
admin-menu	System administrator privileges.
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entire	This entire document.
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revisions	The complete revision history.
scope	Topics covered in this document.
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Date and Revisions

Revision Date	Keyword Affected	Description of Change
10Jun03	discom	New section on DISCOM NETMON.
	index	New keyword for new section.
	introduction	DISCOM NETMON role noted.
	netmon-url	SCF URL changed, group membership required.
06May03	default-report	DNS monitoring added.
		More node pairs monitored.
	details-by-host	
		NETPERF statistics changed, expanded.
		DNS service details added.
	details-by-service	
		By-service control menu added.
	graphs	DNS plots characterized.
	option-menus	Units-setting menu added.
		DNS choice added to menus.
	admin-menu	Shading signal noted.
11Nov02	netmon-url	SCF URL added, OCF alias added.
	default-report	Task buttons added, explained.
		FTP service divided by file size.
	report-builder	New section, added feature explained.
	option-menus	New subsection for clarity.
	set-default	Preserving option choices explained.
	examples	New example of report builder.
	index	New keywords for new sections.
12Sep02	availability	OCF access now uses OTP.
	netmon-url	OCF access now uses OTP.
28Jan02	entire	First edition of NETMON manual.

TRG (10Jun03)

TRG (10Jun03) Contact on the OCF: lc-hotline@llnl.gov, on the SCF: lc-hotline@pop.llnl.gov